Cancelled

I claim:

1. A fiber amplifier comprising

a gain optical fiber having a single-mode core containing dopant ions capable of producing stimulated emission of light within a predetermined band of wavelengths including a wavelength λ_s when pumped with light of wavelength λ_p, said gain fiber having input and output ends,

absorbing ion filtering means for attenuating light at at least some of the wavelengths within said predetermined band of wavelengths, said absorbing ion filtering means comprising umpumped gain ions,

means for introducing a signal of wavelength λ_s into said gain fiber input end,

means introducing pump light of wavelength λ_p into said gain fiber, and

means for preventing the excitation of said pumped gain ions by light of wavelength λ_p.

2. A fiber amplifier in accordance with claim 1 wherein said umpumped gain ions are situated in a signal filtering optical fiber that is connected in series with said gain fiber.

3. A fiber amplifier in accordance with claim 2 wherein said means for preventing excitation is connected in series between said gain fiber and said filtering optical fiber.

4. A fiber amplifier in accordance with claim 3 wherein said means for preventing excitation comprises a fiber-type grating reflector for reflecting pump light.

5. A fiber amplifier in accordance with claim 3 wherein said means for preventing excitation comprises interference filter means for removing pump light.

6. A fiber amplifier in accordance with claim 3 wherein said means for preventing excitation comprises an optical fiber containing a dopant that substantially attenuates light at wavelength λ_p.

7. A fiber amplifier in accordance with claim 6 wherein said pump light attenuating optical fiber connects said signal attenuating fiber to the input end of said gain fiber.

8. A fiber amplifier in accordance with claim 6 wherein said gain fiber comprises first and second sections, and said pump light attenuating fiber comprises first and second sections, said fiber amplifier comprises the serially connected arrangement of the first section of said gain fiber, said first section of said pump light attenuating fiber, said gain ion-doped pump light attenuating fiber, the second section of said pump light attenuating fiber and the second section of said gain fiber, said means for introducing pump light comprising means for introducing pump light into said first and second gain fiber sections.

9. A fiber amplifier in accordance with claim 3 wherein means f r preventing excitation comprises an optical fiber c upler which couples essentially no pump light from said gain fiber to said signal attenuating fiber.

10. A fiber amplifier in accordance with claim 1 wherein said means preventing excitation of umpumped gain i ns by pump light comprises a sufficient length of gain fiber to dissipate all of the pump light introduced therein.

11. A fiber amplifier in accordance with claim 1 wherein said absorbing ion filtering means comprises an optical fiber containing unpumped gain ions and a dopant for absorbing pump light, the concentration of said dopant being much greater than unpumped gain ions.

12. A fiber amplifier in accordance with claim 1 wherein the radial distribution of said gain ions in said gain fiber extends beyond the mode field radius of light of wavelength λ_p, whereby those gain ions at radii greater than said mo field radius are unexcited by pump light and are free to absorb signal light.

13. A fiber amplifier in accordance with claim 1 wherein a section of said gain fiber is fused in side-by-side arrangement to a further section of optical fiber doped with gain ions to form a fused region into which signal light but not pump light can extend from said gain fiber into said further section, whereby those gain ions of said further section are unexcited by pump light and are free to absorb signal light.

14. A fiber amplifier in accordance with claim 1 said gain fiber is in series with an optical fiber containing signal light absorbing ions that are different from said gain ions.

15. A fiber amplifier comprising

a gain optical fiber having a single-mode core containing gain ions capable of producing stimulated emission of signal light within a predetermined band of wavelengths including a wavelength λ_s when pumped with pump light of wavelength λ_p, said gain fiber having first and second ends,

a filtering fiber containing gain ions for filtering signal light,

a pump light-attenuating fiber having a core containing a dopant that attenuates said pump light while signal light remains substantially unattenuated, said pump light-attenuating fiber connecting the second end of said gain fiber to an end of said filtering fiber,

means for introducing pump light of wavelength λ_p into the first end of said said gain fiber, and

means for introducing a signal of wavelength λ_s into one of the ends of the series combination of said gain fiber, said pump light-attenuating fiber and said filtering fiber, the gain ions of said filtering fiber remaining unexcited during operation because of the pump light filtering action of said pump light-attenuating fiber, whereby said filtering fiber alters the spectral gain of said amplifier.

16. A fiber amplifier comprising

first and second gain optical fiber sections, each having a single-mode core containing dopant ions capable of producing stimulated emission of light within a predetermined band of wavelengths including a wavelength λ_s when pumped with light of wavelength λ_p, each gain fiber section having first and second ends,

first and second pump light-attenuating fiber sections, each having a core containing a dopant that attenuates optical power in at least one wavelength band

including said wavelength λ_p, while optical power at said wavelength λ_s remains substantially unattenuated thereby, each pump light-attenuating fiber section having first and second ends, the first end of each of said pump light-attenuating fiber sections being spliced to a respective one of the second ends of said gain fiber sections,

a filtering fiber, the ends of which are respectively connected to the second ends of said pump light attenuating fiber sections, said filtering fiber being doped with gain ions,

means for introducing pump light of wavelength λ_p into the first end of each of said gain fiber sections, and

means for introducing a signal of wavelength λ_s into the first end of one of said gain fiber sections, the gain ions of said filtering fiber remaining unexcited during operation because of the pump light filtering action of said pump light-attenuating fiber.

17. A fiber amplifier comprising

a gain optical fiber having a single-mode core containing dopant ions capable of producing stimulated emission of light within a predetermined band of wavelengths including a wavelength λ_s when pumped with light of wavelength λ_p, said gain fiber having input and output ends,

filtering means for attenuating light at at least some of the wavelengths within said predetermined band of wavelengths, said filtering means containing ions that can be excited by light of wavelength λ_p,

means for introducing a signal of wavelength λ_s into said gain fiber input end,

means introducing pump light of wavelength λ_p into said gain fiber, and

means for preventing the excitation of said filtering means by light of wavelength λ_p.

18. A fiber amplifier in accordance with claim 17 wherein said gain fiber is co-doped with signal light absorbing ions that are different from said gain ions.

19. A fiber amplifier comprising

a gain optical fiber having a single-mode core containing dopant ions capable of producing stimulated emission of light within a predetermined band of wavelengths including a wavelength λ_s when pumped with light of wavelength λ_p, said gain fiber having input and output ends, said dopant ions being selected from the group consisting of erbium, neodymium and praseodymium,

filtering means for attenuating light at at least some of the wavelengths within said predetermined band of wavelengths, said filtering means containing a dopant selected from the group consisting of erbium, dysprosium, neodymium, ytterbium, samarium, praseodymium, thulium, vanadium and cadmium selenide,

means for introducing a signal of wavelength λ_s into said gain fiber input end, and

means introducing pump light of wavelength λ_p into said gain fiber.

20. A gain amplifier in accordance with claim 19 wherein said filtering means comprises an optical fiber containing said dopant ions.

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